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10/571,519	12/20/2006	Juergen Frosien	ZIMR/0034	3269

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EXAMINER	
PURINTON, BROOKE J	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/571,519	FROSIEN ET AL.	
	Examiner	Art Unit	
	Brooke Purinton	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10/06/2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5 and 7-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5 and 7-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 February 2009* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/06/2009*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4, 12-18 and 22-24 are rejected under 35 U.S.C. 102(b) as being taught by Swanson (4139773).

Regarding Claims 1 and 18,Swanson teaches a charged particle beam device (Figure 2) comprising a charged particle emission component as well as a charged particle emission component for providing a charged particle beam (Figure 2), comprising: a first ultra-high vacuum (UHV) region wherein the first UHV region does not comprise elements, which essentially block a portion of the charged particle beam(Figure 1, part 17, 6, 59-61 and 7, 20-25 showing implicit embodiment) a second UHV region (Figure 2, in column 6, Col. 8, line 7) and a residual gas diffusion barrier separating the first and the second UHV regions (Figure 2, part 16) and wherein the first and the second regions each have a vacuum flange (Figure 1, part 40 and) wherein the residual gas diffusion barrier is in beam direction directly subsequent to the emitter and acts as an electrode for extracting or modulating emitted charged particles (4, 10-30).

Regarding Claim 2, Swanson teaches a charged particle emission component according to claim 1, further comprising an emitter in the first UHV region for emitting the charged particle beam (Figure 2, part 18).

Regarding Claim 3, Swanson teaches a charged particle emission component according to claim 1, further comprising an aperture unit for differential pumping between the emission component and a further chamber of a charged particle beam column (Figure 2, part 52).

Regarding Claim 4, Swanson teaches a charged particle emission component according to claim 1, further teach wherein the residual gas diffusion barrier has an opening with a diameter larger than the diameter corresponding to a beam emission angle (9, 55-67 and 10, 14-35).

Regarding Claim 12, Swanson teaches the charged particle emission component according to claim 1, wherein the first vacuum flange corresponding to the first UHV region and the second vacuum flange corresponding to the second UHV region are connected to separate vacuum pumps (Figure 1 and 2, parts 36, and 64).

Regarding Claim 13, Swanson teaches a charged particle emission component according to claim 1, wherein the residual gas diffusion barrier is an isolating aperture and the first and the second UHV regions are UHV chambers (Figure 2).

Regarding Claim 17, Swanson teaches a charged particle emission component according to claim 1, further teach wherein surfaces of the first UHV region are the surfaces of at least the following components (all comments are regards figure 1): the emitter (part 18), the residual gas diffusion barrier (16), and a part of the emission component housing corresponding to the first UHV region (14), and wherein surfaces of the second UHV region are the surfaces of at least the following components (shown in Figure 2): the at least one beam shaping element (66), a differential pumping aperture (64), and a part of the emission component housing corresponding to the second UHV region (58).

Regarding Claims 22 and 24, Swanson teaches a charged particle emission component according to claim 1 or 18. He further teaches wherein the residual gas diffusion barrier comprises a barrier that separates an emitter and at least one of an anode, a lens, and a differential pressure aperture wherein the barrier has a central passage between the emitter and the anode or lens (Figure 2).

Regarding Claim 14, Swanson teaches a charged particle beam device (Figure 2) comprising a charged particle emission component for providing a charged particle beam (Figure 2), comprising: a housing of the charged particle emission component (Figure 2, part 60) an emitter for emitting the charged particle beam with a beam emission angle (Figure 1, part 18), at least one beam shaping element (Figure 2, part 66); and a residual gas diffusion barrier in beam direction directly subsequent to the emitter, wherein the residual gas diffusion barrier separates the charged particle emission component

into a first (Figure 1, part 17) and a second UHV region (Figure 2, part in 58, implicit embodiment, 6, 59-61 and 7, 20-25) wherein the residual gas diffusion barrier has an opening with a diameter larger than the diameter corresponding to a beam emission angle (9, 55-67 and 10, 14-35) and acts as an electrode for extracting or modulating emitted charged particles (4, 10-30) and wherein the first and second UHV regions each have a vacuum flange (Figure 1 and 2, parts 36, and 64).

Regarding Claim 15, Swanson teaches the charged particle emission component according to claim 14, wherein the first UHV region does not comprise elements, which essentially block a portion of the charged particle beam (Figure 1, part 17).

Regarding Claim 16, Swanson teaches a charged emission component according claim 14, comprising an aperture unit for differential pumping between the emission component and a further chamber of a charged particle beam column (Figure 2, part 54).

Regarding Claim 23, Swanson teaches a charged particle emission component according to claim 14, wherein the residual gas diffusion barrier comprises a barrier that separates an emitter and at least one of an anode, a lens, and a differential pressure aperture wherein the barrier has a central passage between the emitter and the anode or lens (Figure 2).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Swanson.

Regarding Claim 10, Swanson teaches the charged particle emission component according to claim 1.

Swanson does not explicitly teach wherein the amount of charged particles impinging on surfaces located in the first UHV region is maximal 20% of an amount of charged particles impinging on surfaces located in the emission component.

However, it would have been obvious at the time to limit the amount of charged particles impinging on surfaces located in the first UHV region is maximal 20% of an amount of charged particles impinging on surfaces located in the emission component since Swanson teaches the limitations of Claims 1, and the limitations of Claims 10 are enabled by those limitations in the applicants specification (page 4, 20-24). Therefore, Swanson also teaches wherein the amount of charged particles impinging on surfaces located in the first UHV region is maximal 20% of an amount of charged particles impinging on surfaces located in the emission component.

Claims 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Knowles** (USPN 5828064) in view of Swanson.

Regarding Claim 19, Knowles teaches a of operating a charged particle beam system, method comprising, evacuating a first ultra-high vacuum (UHV) region to a maximum pressure of 10^{-8} mbar ("including a high pressure zone of the field emission gum which is maintained at a pressure of approximately 10^{-10} Torr," 3, 40-50); evacuating a second UHV region to a maximum pressure of 10^{-8} mbar ("a first intermediate zone maintained at a pressure of approximately 10^{-7} Torr," 3, 40-50, where one of ordinary skill in the art would have recognized than an order of magnitude different falls in the range of approximately, without any criticality) and evacuating at least a further chamber to a maximum pressure of 10^{-5} mbar ("a second intermediate vacuum zone maintained at a pressure of approximately 10^{-4} Torr"3, 40-50).

Knowles fails to teach emitting a charged particle beam such that a portion of the charged particle beam is essentially not blocked (Figure 1) by a residual gas diffusion barrier separating the first and second UHV regions (Figure 2) wherein the residual gas diffusion barrier is in beam direction directly subsequent to the emitter and acts as an electrode for extracting or modulating emitted charged particles (4, 10-30).

Swanson teaches emitting a charged particle beam such that a portion of the charged particle beam is essentially not blocked (Figure 1) by a residual gas diffusion barrier separating the first and second UHV regions (Figure 2) wherein the residual gas diffusion barrier is in beam direction directly subsequent to the emitter and acts as an electrode for extracting or modulating emitted charged particles (4, 10-30).

Modification would have entailed adding a residual gas barrier directly between the emitter and the residual gas barrier to act as an electrode in the apparatus of, for example, Knowles Figure 3.

It would have been obvious to one of ordinary skill in the art to combine the prior art because putting an electron gun UHV would have saved time pumping it down (smaller relative to the 2nd UHV in Swanson), allowed very specific pumping for just the emitter, in case considerations such as condensation need to be taken into account (as per Swansons invention) and lastly, would have allowed the barrier to do double duty as a barrier and an extractor, therefore minimizing the amount of parts in the column which need to be purchased, installed and kept up.

Regarding Claims 20, Knowles and Swanson the method according to claim 19.

Since they teach the limitations of 20 are enabled by those limitations in the applicants specification (page 4, 20-24), they also teach wherein the amount of charged particles impinging on surfaces located in the first UHV region is maximal 20% of an amount of charged particles impinging on surfaces located in the emission component.

Claims 5, 7 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swanson as applied to claim 1 above and Knowles and Swanson as applied to claim 19 above, and further in view of **Ooaeh** et al. (USPN 5854490).

Regarding Claim 5, Swanson teaches the charged particle emission component according to claim 1.

He teaches wherein the residual gas diffusion barrier has an opening for the charged particle beam (Figure 1, part 20, and teach that the opening is .5 mm in one embodiment, but that it is not critical for functionality (4, 16-17)).

They fail to teach wherein the opening has a size of at least 1 mm.

Ooaeh et al. teach wherein a barrier has an opening for the charged particle beam, the opening having a size of at least 1 mm ("an aperture A0 f the Wehnelt 42A has a diameter l4 of about 1.5 mm," 2, 38-39).

Modification would entail using this known value in the apparatus.

It would have been obvious to do this since the aperture of the residual gas diffusion layer needs to be bigger than the majority of the charged particle beam in order to avoid contamination of the electrostatic lens, either due to heating or general degradation. Therefore, in order to keep the electrostatic lens/residual gas diffusion barrier layer from degrading, it would be necessary to allow the beam to travel through it mostly unblocked, as this size would have allowed.

Regarding Claim 7, Swanson teaches charged particle emission component according to claim 1.

He fails to teach it further comprising at least one beam shaping element in the second UHV region wherein the at least one beam shaping element blocks a portion of the charged particle beam by having an opening for the charged particle beam, the opening having a size corresponding to a beam emission angle less than 5°.

Ooaeh et al. teach at least one beam shaping element in a second region wherein the at least one beam shaping element blocks a portion of the charged particle beam by having an opening for the charged particle beam ("block exposure method, a plurality of blocks each having a respective aperture pattern are provided on the mask 13... the charge-particle beam passes through the aperture pattern of the selected block to have a cross section accordingly shaped," 2, 14-22).

Modification entails using the beam blocking element of Ooaeh et al. in the apparatus of Swanson.

It would have been obvious to use the beam blocking element since one of ordinary skill in the art at the time of the invention would recognize another type of art-recognized beam shaping device.

Both fail to teach that the opening having a size corresponding to a beam emission angle less than 5°.

However, "where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). The known conditions are that the beam emission angle is generally between approximately 1 and 180 degrees, as one of ordinary skill in the art would recognize, and therefore finding the opening size which corresponds to a certain optimal value is considered a matter of routine experimentation and not patentably distinctive from other prior art.

Regarding Claim 21, Knowles and Swanson teach the method of operating a charged particle beam device according to claim 19.

They fail to teach wherein a portion of the beam is blocked in the second UHV region, such that the beam is shaped.

Ooaeh et al. teach wherein a portion of the beam is blocked in the second UHV region, such that the beam is shaped ("block exposure method, a plurality of blocks each having a respective aperture pattern are provided on the mask 13... the charge-particle beam passes through the aperture pattern of the selected block to have a cross section accordingly shaped," 2, 14-22).

Modification would entail using the beam blocking method or device of Ooaeh in addition to, or instead of, the condenser lenses of in order to shape and manipulate the beam.

It would have been obvious to one of ordinary skill in the art to utilize this blocking to shape the beam since after the blocking occurs "the shaped cross section pattern ... is reduced in size to be projected onto the wafer. In this manner, one shot of the charged particle beam can create a various fine pattern on the wafer," (2, 20-24) and would require less energy than exerting an electrostatic lens to do the same job, thus increasing the energy efficiency of the instrument or method in question.

Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over and Swanson as applied to claim 1 above and further in view of **Ishida et al.** (USPN 6031235).

Regarding Claim 8, teach the charged particle emission component according to claim 1.

They fail to disclose wherein the first and the second UHV regions have in operation a maximum pressure of 10^{-8} mbar.

They fail to disclose wherein the first and the second UHV regions have in operation a maximum pressure of 10^{-8} mbar (Ishida discloses an embodiment where the two UHV chambers of their disclosure are operated at maximum pressures of 10^{-8} Torr, 3, 53-57).

Modifying by Ishida et al. means changing the vacuum pumping to create this vacuum atmosphere.

It would have been obvious to pump it at these optimal pressures since Ishida et al. disclose that these pressures allows the user to obtain a stable field emission current (1, 25-30).

Regarding Claim 9, teach the charged particle emission component according to claim 1.

They fail to teach wherein the first and the second UHV regions have in operation a maximum pressure difference of one order of magnitude.

Ishida et al. teach wherein the first and the second UHV regions have in operation a maximum pressure difference of one order of magnitude (3, 53-57 where an embodiment disclosed is 10^{-9} and the second vacuum container would be 10^{-8})

Motivation to combine is the same as given in regards to Claim 8.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over and et al.as applied to claim 1 above and further in view of **Wegman** (USPN 3206598).

Regarding Claim 11, Swanson teaches the charged particle emission component according to claim 1.

He fails to teach wherein the first vacuum flange corresponding to the first UHV region and the second vacuum flange corresponding to the second UHV region are connected to one vacuum pump.

Wegman teaches wherein the first vacuum flange corresponding to the first UHV region and the second vacuum flange corresponding to the second UHV region are connected to one vacuum pump (Figure 1, flanges connect two chambers to first one and then a secondary pump, effectively connecting the two flanges to the same pump).

Modification would entail attaching both vacuum flanges of Swanson to the same vacuum pump.

It would have been obvious to one of ordinary skill to substitute the separate vacuum flanges going to the same pump of Wegman (one known element) for the separate vacuum flanges going to different, respective pumps as per Swanson (another known element) in order to obtain the predictable result of still being able to pump down the chamber components and run the electron beam.

Response to Arguments

Applicant's arguments with respect to claims 1-5, 7-24 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kohl: 2516704, FIG 1, part 13 is a residual gas diffusion barrier which also acts as an accelerating electrode.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brooke Purinton whose telephone number is 571.270.5384. The examiner can normally be reached on Monday - Friday 7h30-5h00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on 571.272.2293. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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